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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

American Personal Communications

May 3, 1994

Mr. Ralph Haller
Chairman, PCS Task Force
Federal Communications Commission
2025 M Street, N.W., Suite 5002
Washington, D.C. 20054

Dear Mr. Haller:

American Personal Communications would like to share with you the attached paper prepared by Daniel Vincent, Ph.D, an expert in auction theory who teaches at the Kellogg Graduate School of Management at Northwestern University.

Dr. Vincent's paper makes the case that disaggregating broadband PCS spectrum into smaller "lots" will not enhance auction revenues. Betting on aggregation at auction would likely cause misallocations and generate costs from delay in the aftermarket. The delay that would be caused by aftermarket aggregation would be costly to the PCS industry and the public. According to several sources, including the Personal Communications Industry Association and DSS, delay in bringing PCS to market could endanger the viability of PCS as a vibrant and competitive service.

Dr. Vincent's paper also recognizes that game theory is an important, but imperfect, tool to predict outcomes in auctions. The public policymaker's dilemma to balance the pursuit of the "perfect" auction against potential economic and social costs of delaying the introduction of PCS. Even the so-called "efficiencies" that some parties claim will result from reconfiguring the broadband PCS rules are small (if, indeed, they exist at all) in contrast to the losses that inevitably will accrue from further delaying the introduction of PCS.

Sincerely,

Anne V. Phillips
Vice President, External Affairs

cc: Gen. Docket 90-314/PP Docket 93-253
    The Hon. Reed Hundt
    The Hon. James Quello
    The Hon. Andrew Barrett

Revenue Equivalence and Dividing a Spectrum Block

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Auctions Promote the Efficient Licensing of Spectrum

Auction theory predicts that, in any of a wide range of auction institutions, the buyer who can most efficiently employ an object (or collection of objects) will end up purchasing the good. The strength of this result relies on both technical conditions and strong assumptions about the bidders' rationality and preferences, the information available to them, and the validity of notions such as Nash equilibria approximate descriptions of agents' behavior in strategic environments. Game theory is a successful tool to the extent that it provides a rough guide to predict outcomes in auctions. However, the guide is imperfect. In practice, there will be deviations from these very precise predictions and such deviations may well impose social costs.

Disaggregating Licenses Can Impede This Result

The policymaker's objective is to organize auctions to minimize social costs without sacrificing other sources of gains. With regard to PCS this includes defining the auction methodology as well as defining the PCS "lots," in this case, the number and bandwidth of PCS licenses. The possibility of the failure of auctions to ensure the correct allocation of

PCS licenses has relevance for the issue of the aggregation of spectrum blocks. The more

disaggregated the spectrum block, the greater the number of "auctions" that must be used to

distribute the licenses and thus the greater the scope for a failure at the point of auction.[1]

Many argue that aggregation can take place in the after-market. However, such after-

market aggregation will likely incur social and economic costs, such as delay of service and

increased cost to the consumer.[2] The policymaker can avoid such costs by ensuring that

the auctioned "lots" are the right size.

The risk of the social and economic costs might be justified if other gains might be

enjoyed from this disaggregation. However, as is the case with PCS, if the block is known

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[1]   See, e.g., March 18, 1994 ex parte filing of Time Warner Telecommunications, in
Docket 90-314, Comparing Auctions of 20 MHz and 40 MHz PCS Assignments, prepared by
Howard Raiffa, James Sebenius and David Lax.

[2] The record of expert opinion is rather emphatic on this. See Comments of PacTel
Corporation, PP Docket No. 93-253, PacTel Exhibit, Report of R. Preston McAfee,
"Auction Design for Personal Communications Services." According to McAfee, "it is
important to attempt to design the auction so that the efficient aggregations arise
immediately, and the use of an aftermarket is minimized," at 2.

   See also Comments of Telephone and Data Systems, Inc., PP Docket No. 93-253,
Analysis prepared by Robert J. Weber, "A Proposed Auction Methodology for the Allocation
of PCS Licenses." Weber states that whatever procedure the FCC chooses "should minimize
the need for secondary-market transactions (which consume resources nonproductively and
retard build-out of the licenses) by reaching an efficient allocation resulting in a competitive
market." Weber concedes that "as the PCS market develops and new information becomes
available to licensees subsequent to the initial allocation of licenses, it is inevitable that some
post-allocation transactions will be appropriate. But such transactions entail regulatory,
legal, and management costs: The potential need to cover these costs reduces **both the
initial value of the licenses and the net value created through development of the PCS
market.**" [Emphasis added].

to be more valuable as a complete good than the sum of its value in separate parts, it is hard to conceive of the source of these gains.

Disaggregation Does Not Lead to Higher Auction Revenues

One potential argument might be that greater disaggregation will lead to higher revenues. Can the sale of the good in parts be expected to generate greater revenue than simply the sale of the good as a whole? One of the implications of the revenue equivalence theorem in auctions is that, where the value of the combined item is greater than the sum of its parts, expected revenues cannot be increased by such a division of the objects. In fact, if it is indeed true that the more objects that are to be licensed, the greater is the scope for misallocation, expected revenues could decline.

The following illustration abstracts away cross-regional aggregation intentions and the winner's curse type of effects to examine one simple point -- that breaking up a good that is known to have greater value as a whole cannot be a revenue-enhancing policy.

Suppose that bidders have randomly assigned values for 20 MHz blocks and that a combined 40 MHz block is always worth more than the sum of the two smaller blocks. In all forms of simple auctions of the full 40 MHz block -- English, Dutch, first or second price -- it is well-known that the expected revenue is just the average of the second highest valuation of all the bidders. This is the best-known form of the revenue equivalence theorem. However, the same principle extends easily to illustrate that the total expected revenues stay the same.

Suppose there are $N > 1$ bidders who have independent draws which come equally likely from the range 0 to \$1M determining their value of a spectrum block. Call the value x. If they only obtain 1/2 of the block, the portion is worth $b * x$ to them with $b \leq 1/2$. In an ascending bid auction of the combined spectrum, a dominant strategy is for each individual to bid until the price exceeds the individual's value. The outcome in this auction is an allocation of the good to the highest value bidder and a price equal to the value of the second highest bidder. If the object is sold as two separate blocks of 20 MHz each in simultaneous ascending auctions, a similar revenue result occurs. In the equilibrium of this game, bidders now continue to bid until the price in each block reaches $x/2$. This fact, of course, is a simple case of the much more general revenue equivalence result, which illustrates that as long as the complete object does end up with the highest valuation buyer in any two institutions, then the expected revenues generated by the two institutions will be the same.

In a sense, this example shows a best case scenario, since the outcome of the auction is one in which the "right" bidder always obtains the full license. The result could be overly optimistic. As mentioned above, both the FCC's NPRM and members of the industry have expressed concern that the process of relying on secondary markets to ensure the appropriate allocation will impose real social costs. Splitting up a valuable good into less valuable component units exposes the seller and the market to the (out-of-equilibrium) risk of incurring the costs of a secondary market for the many smaller licenses without any compensating gain. Since there is no revenue gain from auctioning these smaller blocks of spectrum, to avoid the social costs of after-market aggregation, the Commission should auction spectrum licenses in their complete and most valuable form.